

# Preoperative Laparoscopy in Management of Patients With Carcinoma of the Esophagus and of the Esophagogastric Junction

LUIGI BONAVIDA, MD, FACS<sup>1\*</sup> RAFFAELLO INCARBONE, MD,<sup>1</sup> EZIO LATTUADA, MD,<sup>1</sup>  
ANDREA SEGALIN, MD,<sup>1</sup> BRUNO CESANA, MD,<sup>2</sup> AND ALBERTO PERACCHIA, MD, FACS<sup>1</sup>

<sup>1</sup>Department of General Surgery and Surgical Oncology, University of Milan, Milan, Italy

<sup>2</sup>Epidemiology Unit, Ospedale Maggiore Policlinico I.R.C.C.S., Milan, Italy

**Background and Objectives:** Adequate preoperative staging of patients with esophageal and cardia carcinoma offers the potential for a rational choice of the therapy. The aim of this study was to assess the diagnostic value of laparoscopy compared to ultrasonography (US) and computed tomography (CT) in detecting intra-abdominal metastatic spread.

**Methods:** Between November 1995 and December 1996, 36 patients with adenocarcinoma of the cardia and 14 patients with squamous cell carcinoma of the lower third of the esophagus were studied with CT scan and US, followed by laparoscopy performed at the same session of planned surgical resection. Mean operative time of laparoscopy was 20 minutes (range 15–55 min). There was no mortality nor morbidity related to the laparoscopic procedure.

**Results:** Laparoscopy lead to a change of the therapeutic approach in five patients (10%): three patients with peritoneal carcinosis undetected at the imaging examinations, and one patient with advanced liver cirrhosis with signs of portal hypertension did not undergo resection; conversely, one patient with a liver hemangioma simulating a metastatic mass at CT/US underwent esophagogastric resection. Laparoscopy showed a higher sensitivity than US and CT in detecting peritoneal metastases (71% vs. 14% vs. 14%, respectively), macroscopic nodal metastases (78% vs. 11% vs. 55%), and liver metastases (86% vs. 86% vs. 71%).

**Conclusions:** Laparoscopy represents a safe and effective diagnostic procedure in the preoperative staging of esophageal and cardia carcinoma; it provides the potential to avoid unnecessary exploratory laparotomies and to select the most appropriate treatment.

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**KEY WORDS:** laparoscopy; preoperative staging; cardia adenocarcinoma; esophageal squamous-cell carcinoma; metastases; liver cirrhosis

## INTRODUCTION

Computed tomography and ultrasonography, although widely utilized in the staging of esophageal neoplasms, are not reliable enough in the evaluation of intra-abdominal tumor spread. In a recent series of patients with malignancies of the lower esophagus and esophagogastric junction, computed tomography and transabdominal ultrasonography correctly staged only 64% of the primary tumors [1]. This makes difficult the choice of

the therapeutic approach in the individual patient, i.e., primary resection, neoadjuvant therapy, or endoscopic palliation, and it may result in a high number of unnecessary exploratory laparotomies.

Laparoscopy is being widely used in gynecology for

\*Correspondence to: Dr. Luigi Bonavina, Ospedale Maggiore Policlinico, Pad. Monteggia, Via F Sforza 35, 20122 Milan, Italy. Tel: +39-2-55035822; Fax: +39-2-55194882

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diagnostic and therapeutic purposes and in general surgery mostly for the treatment of benign diseases. A limited experience with laparoscopy in the staging of upper gastrointestinal tract malignancies has been reported [2–4]. The aim of this study was to assess the diagnostic value of laparoscopy compared to ultrasonography and computed tomography in the preoperative staging of patients with cancer of the esophagus and of the esophagogastric junction.

## MATERIALS AND METHODS

A prospective study was carried out between November 1995 and December 1996. Fifty patients with esophageal carcinoma were consecutively enrolled. There were 39 males and 11 females, with a mean age of 58 years (range 31–81 yr). Thirty-six patients had histologically proven adenocarcinoma of the distal esophagus or cardia. Fourteen patients had squamous-cell carcinoma of the lower third of the esophagus. Preoperative staging studies included transabdominal ultrasonography (US) and computed tomography (CT) of the abdomen and chest in all patients.

Laparoscopy was performed under general anesthesia at the same operating session of the planned surgical resection. After placement of a Veress needle and CO<sub>2</sub> insufflation of the peritoneal cavity, a laparoscope was introduced above the umbilicus. In most cases, a 30° oblique viewing laparoscope was used. One or two additional trocars were inserted in the upper abdomen to allow manipulation of the viscera and irrigation/aspiration of the peritoneal cavity. Exploration of the abdominal cavity included the peritoneal surface, the lesser omentum, and the liver. The inspection continued in the lower abdomen. Subsequently, diagnostic peritoneal lavage with 200 ml of saline solution was performed. In one patient with liver metastases, laparoscopic ultrasound examination was carried out using a Aloka 7.5 Mhz linear probe.

The sensitivity, specificity, accuracy, positive and negative predictive values of laparoscopy, US, and CT in the diagnosis of hepatic, nodal, and peritoneal metastases were calculated. Additionally, laparoscopy, US, and CT were compared by Cohen's *k* statistic [5], and the agreement of the examinations was evaluated according to Landis and Koch scale [6].

## RESULTS

The median operation time was 20 minutes (range 15–55 min). There was no mortality or morbidity related to the procedure itself, but in one patient moderate bleeding occurred due to manipulation of a liver hemangioma.

In the group of patients with adenocarcinoma, there were five false negative findings of laparoscopy detected subsequently at the exploratory laparotomy: focal peritoneal carcinosis (2 patients), neoplastic infiltration of

diaphragmatic crura and metastases to celiac and splenic nodes (1 patient), metastases to celiac nodes and neoplastic infiltration of pancreas (1 patient), liver metastases (1 patient). In this latter individual, a 0° degree telescope was used and a metastatic nodule located on the top of the dome of the liver was missed. These five patients were false negative also at the CT-US examination. There were no false positive findings at laparoscopy, but there was one false positive with the conventional imaging techniques, i.e., a patient with a liver hemangioma simulating a metastatic mass of the lesser omentum. Laparoscopy lead to a change of therapeutic strategy in 3 out of 36 patients with adenocarcinoma (8%) in whom the decision to operate would have been based upon preoperative ultrasonography and/or CT scan: two patients with previously undetected peritoneal carcinosis did not undergo the planned esophagogastric resection, and one patient in whom a liver hemangioma simulating a metastatic mass on CT/US underwent esophagogastric resection. Lavage cytology showed free tumor cells in one patient with adenocarcinoma and peritoneal carcinosis.

In the group of patients with squamous-cell carcinoma, a false negative of the imaging study occurred in two patients with celiac lymph nodal metastases; one of these patients also had peritoneal carcinosis. In addition, laparoscopy allowed diagnosis of an advanced liver cirrhosis with signs of portal hypertension in a patient who underwent endoscopic prosthetic intubation during the same operative session. This represented a change in the therapeutic strategy in 2 out of 14 patients (14%) with squamous cell carcinoma. Lavage cytology was negative in all patients with squamous cell carcinoma. In the only patient in whom laparoscopic ultrasound examination was performed, two liver metastases (segments III and VIII) were identified and treated by alcohol injection under echolaparoscopic guidance.

Sensitivity, specificity, accuracy, positive and negative predictive values of laparoscopy compared to US and CT in the diagnosis of hepatic, nodal, and peritoneal metastases are listed in Tables I, II, and III. The results of the analysis of agreement of the tests according to Landis and Koch scale are reported in Table IV.

## DISCUSSION

In contrast to what was believed only a few decades ago, esophageal cancer is now regarded as a potentially curable disease. This is especially true for tumors that, irrespective of the histological type, are located distal to the tracheal bifurcation. Retrospective and multivariate analyses have clearly shown that R0 resection is the most important prognostic factor affecting survival [7–9]. Patients in whom a R0 resection is questionable should undergo neoadjuvant therapy with the aim to downstage the tumor and increase the chance for a R0 resection on subsequent surgery [10–11]. Accurate tumor staging

**TABLE I. Sensitivity, Specificity, Accuracy, Positive and Negative Predictive Values of Laparoscopy Compared to Ultrasound (US) and Computerized Tomography (CT) for Diagnosis of Liver Metastases in Staging of Cardia and Esophageal Carcinoma**

	LAP	US	CT
True positive	6	6	5
True negative	43	43	43
False positive	0	0	0
False negative	1	1	2
Sensitivity (%)	86	86	71
Specificity (%)	100	100	100
Accuracy (%)	98	98	96
Positive predictive value	1	1	1
Negative predictive value	0.98	0.98	0.96

**TABLE II. Sensitivity, Specificity, Accuracy, Positive and Negative Predictive Values of Laparoscopy Compared to Ultrasound (US) and Computerized Tomography (CT) for Diagnosis of Macroscopic Nodal Metastases in Staging of Cardia and Esophageal Carcinoma**

	LAP	US	CT
True positive	7	1	5
True negative	41	40	40
False positive	0	1	1
False negative	2	8	4
Sensitivity (%)	78	11	55
Specificity (%)	100	97	97
Accuracy (%)	96	82	90
Positive predictive value	1	0.5	0.83
Negative predictive value	0.95	0.83	0.91

**TABLE III. Sensitivity, Specificity, Accuracy, Positive and Negative Predictive Values of Laparoscopy Compared to Ultrasound (US) and Computerized Tomography (CT) for Diagnosis of Peritoneal Carcinosis in Staging of Cardia and Esophageal Carcinoma**

	LAP	US	CT
True positive	5	1	1
True negative	43	43	43
False positive	0	0	0
False negative	2	6	6
Sensitivity (%)	71	14	14
Specificity (%)	100	100	100
Accuracy (%)	96	88	88
Positive predictive value	1	1	1
Negative predictive value	0.96	0.88	0.88

seems, therefore, essential in order to provide optimal patient care.

Compared to the conventional imaging methods, laparoscopy can add relevant information to the staging of esophagogastric tumors, allowing detection of unsuspected metastatic deposits in the liver and in the peritoneal cavity. Detection of lymph node metastases is of lesser importance since their presence does not always preclude surgical resection of the primary neoplasm. In

**TABLE IV. Agreement of Laparoscopy (LAP), Ultrasound (US) and Computerized Tomography (CT) by Cohen's k Statistic and Evaluation of Agreement According to Landis and Koch Scale [6]**

	k	S.D. <sup>a</sup>	95% Confidence interval	Agreement
Liver metastases				
LAP vs. US	0.912	0.087	0.74–1	Very good
LAP vs. CT	0.811	0.128	0.55–1	Very good
US vs. CT	0.898	0.100	0.70–1	Very good
Nodal metastases				
LAP vs. US	0.171	0.181	–0.19–0.53	Mild
LAP vs. CT	0.735	0.145	0.44–1	Good
US vs. CT	0.468	0.216	0.004–0.90	Moderate
Peritoneal metastases				
LAP vs. US	0.310	0.240	–0.17–0.79	Mild
LAP vs. CT	0.310	0.240	–0.17–0.79	Mild
US vs. CT	1	—	—	Very good

<sup>a</sup>Standard deviation.

our study, laparoscopy showed a higher sensitivity than US and CT in the diagnosis of peritoneal metastases (71% vs. 14% vs. 14%, respectively), macroscopic nodal metastases (78% vs. 11% vs. 55%), and liver metastases (86% vs. 86% vs. 71%).

Liver cirrhosis represents another important laparoscopic finding, but it is more common in patients with squamous cell carcinoma [12–13]. The incidence of liver cirrhosis in the present series was 1/14 patients (7.1%), which is similar to the data reported in the literature [14]. It should be emphasized that the mortality rate after esophagogastric resection is >20% in cirrhotic patients even without preoperative evidence of liver failure [14]. Therefore, laparoscopy plays a major role in the screening of patients with suspected liver dysfunction and portal hypertension.

The results of the present study show that laparoscopy performed at the same session of planned esophagogastric resection represents a safe and effective diagnostic procedure. Laparoscopy proved to be the “gold standard” in the evaluation of peritoneal metastases. Transabdominal US has a similar accuracy in detecting liver metastases, whereas CT scan is of value in detecting nodal and liver metastases and should be considered complementary to the other procedures. In our series, laparoscopy allowed to change therapeutic strategy in 5 out of 50 consecutive patients (10%). This is in agreement with the findings of other investigators who found that laparoscopy had a greater sensitivity compared to combined imaging in staging esophagogastric tumors [13,15,16], and it could obviate the need for unnecessary exploratory surgery in up to 21% of patients [17], especially in those with adenocarcinoma of the cardia.

It is possible that routine exploration of the lesser sac can further increase the sensitivity of the procedure. However, recent advances with laparoscopic ultrasound

allow a more accurate staging by replacing the absence of tactile sensitivity of laparoscopic instruments and may obviate the need to dissect the gastrocolic ligament [18]. Echolaparoscopy has proven to be a valuable tool for detection and fine-needle biopsy of deep lesions, such as retroperitoneal masses and intraparenchymal liver metastases of <1 cm [13,19]. A flexible probe seems essential to avoid missing metastases located on the top of the dome of the liver [20]. Finally, in our experience, palliative laparoscopic treatment of liver metastases was safe and effective. Compared to the conventional US-guided technique, echolaparoscopy allows injection of liver metastases under direct vision and controlled apnea using larger volumes of alcohol.

We conclude that laparoscopy represents a useful addition to the preoperative evaluation of patients with carcinoma of the lower esophagus and cardia. This staging method offers the potential to prevent unnecessary laparotomies, to decrease costs of hospitalization, and to select patients for alternative therapeutic options.

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